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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------|-------------|----------------------|---------------------|------------------|
| 10/779,356      | 02/12/2004  | James M. Freitag     | HSJ9-2003-0258US1   | 7887             |

34036 7590 06/23/2006

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EXAMINER

BLOUIN, MARK S

ART UNIT PAPER NUMBER

2627

DATE MAILED: 06/23/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

|                              |                 |                |  |
|------------------------------|-----------------|----------------|--|
| <b>Office Action Summary</b> | Application No. | Applicant(s)   |  |
|                              | 10/779,356      | FREITAG ET AL. |  |
|                              | Examiner        | Art Unit       |  |
|                              | Mark Blouin     | 2627           |  |

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-25 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-25 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 12 February 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. ____. |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>2/12/04</u> . | 6) <input type="checkbox"/> Other: ____.  |

## Detailed Action

### *Claim Rejections - 35 USC § 102*

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 1, 5-12, and 16-23 are rejected under 35 U.S.C. 102(e) as being anticipated by Katti et al (US 6,707,084).

3. Regarding Claims 1, 11, 12, and 21, Katti et al shows (Figs. 4-5) a spin valve sensor comprising:

a ferromagnetic free layer structure (412); a ferromagnetic pinned layer structure (404); a nonmagnetic spacer layer (408) located between the free layer structure and the pinned layer structure; and a capping layer structure (416, 418) including a refractory metal (tantalum – Col 6, line 60) layer and a silicon layer (CrSi – Col 7, line 3), wherein the refractory metal layer (416) is disposed between the free layer (412) structure and the silicon layer (418), wherein a capping layer structure comprising a first capping layer (416) and a second capping layer (418), the first capping layer located between the second capping layer and the pinned layer structure (404), the first capping layer interfacing with the second capping layer to form a silicide that provides a compressive stress on the pinned layer structure (inherent).

4. Regarding Claims 5, 6, 22, and 23, Katti et al shows (Figs. 4-5) the spin valve sensor, further comprising a protective metal layer (414) made of Ta (Col 6, line 36 – material of high

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resistivity) interfacing the free layer structure (412) and disposed between the refractory metal layer (416) and the free layer structure (412).

5. Regarding Claim 7, Katti et al shows (Figs. 4-5) the spin valve sensor, wherein the protective metal layer has a thickness in a range of 25A to 50A (Col 10, line 53).

6. Regarding Claim 8, Katti et al shows (Figs. 4-5) the spin valve sensor, wherein a silicide is formed between the refractory metal layer and the silicon layer (inherent – depositing silicon on a refractory metal forms a silicide).

7. Regarding Claim 9, Katti et al shows (Fig. 3) the spin valve sensor, wherein the pinned layer structure is a self-pinned pinned layer structure that comprises: a first ferromagnetic pinned layer (306) and a second ferromagnetic pinned layer (310), wherein the first ferromagnetic pinned layer is pinned in a first direction and the second ferromagnetic pinned layer is pinned in second direction that is antiparallel to the first direction (Col 4, lines 58-67); and a coupling layer (308) located between the first ferromagnetic pinned layer and the second ferromagnetic pinned layer.

8. Regarding Claim 10, Katti et al shows (Figs. 4-5) the spin valve sensor, wherein the free layer structure (412) is located between the spacer layer(408) and the capping layer structure (416,418).

9. Regarding Claim 16, Katti et al shows (Figs. 4-5) the spin valve sensor, wherein the second capping layer (418) is formed from silicon (CrSi – Col 7, line 3).

10. Regarding Claim 17, Katti et al shows (Figs. 4-5) the apparatus, wherein the spin valve sensor further comprises a protective metal layer (414) disposed between the first capping layer (416) and the pinned layer (404) structure.

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11. Regarding Claim 18, Katti et al shows (Figs. 4-5) the apparatus, wherein the protective metal layer (404) interfaces the free layer structure (412) and the first capping layer (416) interfaces the protective metal layer (404).

12. Regarding Claim 19, Katti et al shows (Figs. 4-5) the apparatus, wherein the free layer structure (412) is located between the pinned layer structure (404) and the capping layer structure (416,418).

13. Regarding Claim 20, Katti et al shows (Figs. 4-5) the apparatus is a magnetic head assembly (Col 3, lines 55-59).

***Claim Rejections - 35 USC § 103***

14. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

15. Claims 2,13, and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Katti et al (US 6,707,084).

16. Regarding Claim 2,13, and 24, Katti et al shows (Figs. 4-5) all the features described, *supra*, including a refractory metal layer (416), but does not show it to be made out of ruthenium and molybdenum.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute the Ti layer of Katti with a ruthenium or molybdenum layer.

The rationale is as follows: One of ordinary skill in the art at the time of the invention would have been motivated to substitute the Ti layer of Katti with a ruthenium or molybdenum layer because they are known refractory metals that are used in spin valves and using them is merely a substitution of art recognized equivalents.

17. Claims 3,4,14,15, and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Katti et al (US 6,707,084) in view of Schwarz et al (US 6,897,532).

18. Regarding Claims 3,4,14,15, and 25, Katti et al shows (Figs. 4-5) all the features described, *supra*, but does not show the spin valve sensor, wherein the refractory metal layer has a thickness in a range of 5A to 30A and the silicon layer has a thickness in a range of 5A to 30A, wherein the refractory metal layer has a thickness of approximately 15A and the silicon layer has a thickness of approximately 15A.

Schwarz et al shows that the capping layers may be in those ranges and thicknesses (Col 10, lines 59-61).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to provide the capping layers of Katti et al with the claimed dimensions through routine experimentation and optimization in the absence of criticality as taught by Schwarz et al. More particularly, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation. *In re Swain et al.*, 33 CCPA (Patents) 1250, 156 F.2d 239 70 USPQ 412; *Minnesota Mining and Mfg. Co. v Coe*, 69 App. D.C. 217, 99 F. 2d 986, 38 USPQ 213; *Allen et al. v Coe*, 77 App. D.C. 324, 135 F. 2d 11, 57 USPQ 136.

*Conclusion*

19. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mark Blouin whose telephone number is 571-272-7583. The examiner can normally be reached on M-F from 6:00 to 3:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Hoa Nguyen, can be reached on 571-272-7579. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

A handwritten signature in black ink, appearing to read 'M. Blouin', with a long horizontal flourish extending to the right.

Mark Blouin  
Patent Examiner  
Art Unit 2627  
June 20, 2006